EFFECT OF WEATHERING UPON DRY MATTER AND COMPOSITION OF HARDWOOD LEAVES

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IN A previous article[1] the writer presented data showing some of the changes in composition of hardwood leaves during the first 7 or 8 weeks following leaf fall. The species investigated —hickory, white oak, beech, and maple (sugar and red maple mixed)—showed relatively little change in calcium content, but there was a distinct loss in potassium and phosphorus. However, no measurements were made on the loss in dry matter, and because of that fact the total loss of constituents could not be determined.

Since that time the experiment has been repeated on a somewhat larger scale, with cognizance taken of the dry matter loss. The procedure followed in collecting the leaf samples was identical to that used previously. However, in the case of the samples left out for weathering, instead of spreading the leaves out on the ground under a square of poultry wire, definite weighed amounts of leaves—75 to 200 g. —were placed in flats, such as are used in greenhouse work, measuring 11 x 18.5 x 3 inches inside, and constructed of wooden sides and ends, and a 1/8-inch mesh hardware cloth bottom. The flat was covered with 1/4-inch hardware cloth to prevent the leaves from blowing away. These were placed on the ground under the tree from which the leaves were taken and were allowed to remain there seven weeks. Similar samples of the freshly collected leaves were taken to the laboratory, dried at 32 to 33°C., and weighed. At the end of the period the exposed samples were brought in, dried at 32-33°C., and weighed, and then all samples were analyzed.

The locations and tree species selected for this study were as follows: *A.* Mount Carmel, on the property of E. Minor. A stand of unevenaged mixed hardwoods on Holyoke fine sandy loam soil. Species: beech (*Fagus grandifolia*), dogwood (*Cornus florida*), sugar and red maple (*Acer saccharum* and *A. rubrum*).

B. Experiment station grounds, New Haven. Shade trees surrounded by lawn, on Wethersfield fine sandy loam soil. Species: sugar maple, shagbark hickory (*Carya ovata*), and white oak (*Quercus alba*).

The results of the analysis, on a percentage basis, are given in Table 1. The potassium and phosphorus losses are considerably smaller than they were in the 1932 experiments, a variation readily accountable for by the difference in rainfall in the two years. During the several periods of exposure in 1932 the approximate precipitation was as follows: during the exposure of the hickory, 11.2 inches; of the white oak, 9.1 inches; of the beech, 8.2 inches; of the maple, 8.7 inches. In contrast, the precipitation in 1933 was only 2.5 inches during the seven-week period.

In both experiments losses of K and P were highest in the beech, and losses of P were lowest in the hickory leaves. Changes in both calcium and nitrogen were relatively small.

In order to get at the true changes in composition following leaf fall,

[1] Lunt, Herbert A. 1933. Effect of weathering upon composition of hardwood leaves. Jour. For. 31:43-45.

the data were recalculated on the basis of the amount present in the unweathered leaves. In other words, out of 100 grams of original material, how many grams of each constituent were lost in the weathering process and what was the percentage loss? These data are given in Table 2.

The loss in dry matter was greatest in the red maple and the dogwood leaves, and least in the beech and oak. This dissimiliarity in dry matter loss is reflected in the percentage losses of the individual elements, changing their order relative to the amount of loss and in some cases converting an apparent loss into a gain, or vice versa. These results confirm those of the previous experiment, and in addition serve to show what may be expected in changes in dry matter of the several species during the period immediately subsequent to leaf fall.

TABLE 1

EFFECT OF WEATHERING UPON COMPOSITION OF FOREST LEAVES.[1] PERCENTAGE BASIS. 1933 RESULTS.

	Ash	Ca		K			P		N
	Per cent	Per cent	Per cent of ash	Per cent	Loss Per cent	Per cent of ash	Per cent	Loss Per cent	Per cent
Mt. Carmel samples									
Beech									
Fresh	6.65	0.596	8.96	1.255		18.87	0.306		0.662
Weathered	5.97	0.606	10.15	0.693	44.9	11.60	0.201	34.3	0.694
Dogwood									
Fresh	9.32	2.078	22.30	1.693		18.16	0.204		0.650
Weathered	8.59	2.226	25.91	0.979	42.2	11.40	0.173	15.2	0.745
Red Maple									
Fresh	5.310	0.948	17.85	0.745		14.03	0.183		0.530
Weathered	6.205	1.100	17.72	0.567	23.9	9.14	0.153	16.4	0.603
Sugar maple									
Fresh	8.100	1.627	20.09	0.875		10.80	0.214		0.740
Weathered	8.750	1.668	19.06	0.682	22.1	7.79	0.187	12.6	0.780
Experiment station samples									
Sugar maple									
Fresh	7.950	1.593	20.03	0.976		12.27	0.092		0.648
Weathered	8.750	1.818	20.77	0.682	30.1	7.79	0.080	13.0	0.605
Hickory									
Fresh	9.815	2.161	22.02	1.370		13.95	0.119		0.721
Weathered	9.820	2.358	24.01	0.866	36.8	8.81	0.123	+3.4	0.781
White oak									
Fresh	5.895	1.522	25.81	0.610		10.34	0.179		0.499
Weathered	5.890	1.568	26.62	0.433	29.0	7.35	0.154	14.0	0.680

[1]Approximate rainfall during the period of exposure, 2.5 inches.

TABLE 2

LOSSES OF THE SEVERAL CONSTITUENTS, BASED UPON THE AMOUNT ORIGINALLY PRESENT IN 100 GRAMS OF UNWEATHERED LEAVES. 1933 RESULTS.

	Dry matter		Total loss, in grams and percentage									
			Ash		Ca		K		P		N	
	g.	Per cent	g.	Per cent	g.	Per cent	g.	Per cent	g.	Per cent	g.	Per cent
Mt. Carmel samples												
Beech												
Fresh	100											
Weathered	97.3	2.74	.845	12.7	.007	1.17	.581	46.29	.110	35.9	+.013[1]	+1.96
Dogwood												
Fresh	100											
Weathered	88.4	12.29	1.727	18.53	.110	5.29	.828	48.85	.051	25.0	+.0005	+0.08
Red maple												
Fresh	100											
Weathered	87.6	12.44	+.125	+2.35	+.016	+1.69	.248	33.3	.049	26.8	.002	0.38
Sugar maple												
Fresh	100											
Weathered	93.0	7.03	+.037	+ .456	.076	4.67	.241	27.54	.040	18.7	.015	2.03
Experiment station samples												
Sugar maple												
Fresh	100											
Weathered	93.3	6.72	+.213	+2.68	+.103	+6.46	.340	34.83	.017	18.5	.084	12.96
Hickory												
Fresh	100											
Weathered	93.3	6.69	.653	6.65	+.039	+1.80	.562	41.00	.004	3.4	+.008	+1.11
White oak												
Fresh	100											
Weathered	97.4	2.59	.158	2.68	+.005	+ .33	.188	30.80	.029	16.2	+.163	+32.67

[1]Plus sign (+) indicates gain instead of loss.

Formulae: 1. $f-(wd)=g$

2. $\frac{g \times 100}{f}$

In which: f=Percentage of element in fresh leaves.
w=Percentage of element in weathered leaves.
d=grams of dry matter, weathered leaves.
g=Loss of the element, grams.
p=Loss of the element, per cent.